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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/784,021	02/16/2001	Chiaki Terasawa	684.3140	1607

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EXAMINER

SCHWARTZ, JORDAN MARC

ART UNIT PAPER NUMBER

2873

DATE MAILED: 04/22/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/784,021

Applicant(s)

TERASAWA ET AL. *W*

Examiner

Jordan M. Schwartz

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-36 is/are rejected.
- 7) ☒ Claim(s) 37 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 February 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3,4.

- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: .

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

For applicant's information, the drawings submitted February 16, 2001 were approved by the examiner.

Specification

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

Claim 37 objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim cannot depend from another multiple dependent claim. See MPEP § 608.01(n). Accordingly, the claim has not been further treated on the merits.

Claims 14 and 19-21 are objected to for the following reasons. Since the intended meanings could be determined from what is set forth in the specification and Figures, 112 rejections were not made but instead these lack of clarity issues were raised in the following objections.

In reference to claim 14, applicant is claiming "a second field mirror group" but has not claimed a "first field mirror group" which creates a lack of clarity. The assumed meaning of the

claim is "a first field mirror group comprising a first field mirror and a second field mirror group comprising a second field mirror" and this is the suggested change to provide the needed clarity.

In reference to claims 19-21, applicant uses the terms "LM1" and "LM2" however these terms are not defined within these claims creating the lack of clarity. From what is set forth in the specification, "LM1" is defined as "the paraxial distance between the object and the first mirror" and "LM2" is defined as "the paraxial distance between the first and second mirrors" and it is suggested that applicant insert these definitions into these claims (or change the claim dependencies) to provide the required clarity.

Claims 14-16 are objected to because of the following informalities: in these claims, "filed" should be corrected to "field" to correct an obvious typographical error. Appropriate correction is required.

Claim Rejections - 35 USC § 112

Claims 1, 23, 26 and 30 (and their respective dependent claims 2-22, 24-25, 27-29, and 31-36) are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In reference to claim 1, applicant is claiming, "disposed along a common straight optical axis" and the intended meaning is not clear rendering the claim vague and indefinite. Specifically, in the Figures 1 and 2 embodiments, optical element "M2" is disposed below the optical axis. It is therefore not clear how far above or below the optical axis an optical element could be located and still be considered "along a common straight optical axis". By way of example, references such as Williamson, used below, have optical elements below (and above) a

straight optical axis, similar to applicant's Figures 1 and 2 embodiments and therefore were considered to be "along a common straight optical axis". Furthermore, by definition (Webster's Dictionary), "along" is defined as "In a line with". However, if an optical element is below the optical axis then it is not "in a line with" the optical axis and therefore the intended meaning is not clear. Additionally, imaging optical systems typically comprise numerous optical elements. It is additionally not clear if applicant is claiming that all of the optical elements within an optical system have to be disposed "along a common straight optical axis" i.e. "the optical system in its entirety" or if this limitation is satisfied with any (but not necessarily all) of the optical elements of the imaging optical system "along a common straight optical axis".

In reference to claim 23, applicant is claiming that the first optical system has a lens group of positive optical power "disposed closest to the object side" and it is not clear what it is closest relative to thereby rendering the claim vague and indefinite. Specifically, it is not clear if applicant is claiming that this claimed lens group of positive optical power is the most object side lens group of the projection optical system (the assumed meaning), is the most object side lens group of the first imaging optical system, or if some other meaning is intended and the lack of clarity renders the claim vague and indefinite.

In reference to claims 26 and 30, applicant is claiming "passes a lens" and it is not clear if applicant means "passes through the lens", "passes an outside of an effective diameter of the lens" or if some other meaning is intended and the lack of clarity renders these claims vague and indefinite. Specifically, in reference to claim 26 the assumed meaning is "passes through a lens of said second mirror group" (such as the Figure 16 embodiment). In claim 30, the assumed

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meaning is "passes through said positive lens and then is reflected by said first field mirror" (such as the Figure 23 embodiment).

Claim Rejections - 35 USC § 102

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 1-2 and 31-36 are rejected under 35 U.S.C. 102(e) as being anticipated by

Takahashi et al.

Takahashi et al reads on these claims by disclosing the limitations therein including the following: a projection optical system for projecting an image of an object onto an image plane (abstract) comprising a first image optical system for forming an image of the object (abstract, Figure 1, "10"); a second imaging optical system for re-imaging the image upon the image plane (abstract, Figure 1, "20"); the first and second imaging optical systems disposed in order and along a common straight optical axis (to the extent this term is understood re Figure 1, wherein all of the optical elements of the first optical system ("10") and the second optical system ("20") are on the same straight optical axis "AX"). Takahashi et al further discloses the first optical system including a first mirror for collecting and reflecting abaxial light (Figure 1, "M1"); one of the first or second imaging optical systems including a second mirror for reflecting light from the first mirror to the image plane side (Figure 1, "M2"); with the second mirror the abaxial light is caused to pass an outside of an effective diameter of the first mirror (Figure 1 re outside of the

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effective diameter of "M1"); the first image optical system having a magnification greater than or equal to 1 (column 13, line 2); the system telecentric with respect to both the object and image plane (column 18, line 45); the projection optical system has a magnification of reduction ratio (abstract); the projection optical system further providing a field stop at the position of the image defined by the first imaging optical system (Figure 1, "FS"). The field stop of Takahashi et al will inherently change at least one of the size and the shape of the imaging region on the imaging plane, this being reasonably based upon the similarity in structure and the location of the field stop between Takahashi et al and that of the claimed invention. The field stop of Takahashi et al is further "disposed inside of the second imaging optical system" (Figure 1 re inside of "20"). Takahashi et al further discloses the system for projecting a pattern of a mask onto a substrate (column 1, line 6 re projection exposure apparatus for fabricating semiconductor); and the system using an excimer laser (column 7, line 31). The laser of Takahashi et al would inherently include one of an ArF excimer laser or an F₂ laser, this being reasonably based upon Takahashi et al disclosing the laser as an excimer laser, the system being used for an exposure apparatus similar to the claimed invention, as well as upon the similarity in structure between Takahashi et al and that of the claimed invention.

Claims 1, 3-7, 31-32 and 35-36 are rejected under 35 U.S.C. 102(b) as being anticipated by Matsumoto.

Matsumoto et al reads on these claims by disclosing the limitations therein including the following: a projection optical system for projecting an image of an object onto an image plane (abstract) comprising a first image optical system for forming an image of the object (abstract, Figures 1-3, "S1"); a second imaging optical system for re-imaging the image upon the image

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plane (abstract, Figures 1-3, "S2"); the first and second imaging optical systems disposed in order and along a common straight optical axis (Figures 1-3, wherein all of the optical elements are apparently at least touching the straight optical axis and all are apparently along a common straight optical axis to the extent this term is understood). Matsumoto further discloses the first optical system including a first mirror for collecting and reflecting abaxial light (Figures 1-3, "M2"); one of the first or second imaging optical systems including a second mirror for reflecting light from the first mirror to the image plane side (Figures 1-3, "M3"); with the second mirror the abaxial light is caused to pass an outside of an effective diameter of the first mirror (Figure 1 re outside of the effective diameter of "M2"); the first imaging optical system including at least one positive lens (Figure 2 embodiment, column 8, line 63. "P12"); the second imaging optical system including at last one positive lens (Figure 2 embodiment, column 8, line 65, "P22"); a second lens group between the first and second mirrors (Figure 3 embodiment re "L1" and figure 8 embodiment re "LA3"); the system can be telecentric with respect to both the object and image plane (column 6, line 40 and column 13, line 7); the projection optical system has a magnification of reduction ratio (abstract); and the system for projecting a pattern of a mask onto a substrate (column 1, lines 10-25). The system of Matsumoto would inherently include one of an ArF excimer laser or an F₂ laser, this being reasonably based upon Matsumoto et al disclosing the system being used for an exposure apparatus similar to the claimed invention, as well as upon the similarity in structure between Matsumoto and that of the claimed invention.

Claims 1, 3-7, 31-32 and 35-36 are rejected under 35 U.S.C. 102(b) as being anticipated by Williamson.

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Williamson reads on these claims by disclosing the limitations therein including the following: a projection optical system for projecting an image of an object onto an image plane (abstract) comprising a first image optical system for forming an image of the object (abstract, Figure 1, column 2, lines 38-60, "R1" through "M3"); a second imaging optical system for re-imaging the image upon the image plane (abstract, Figure 1, column 2, line 60, "M4" through "M6"); the first and second imaging optical systems disposed in order and along a common straight optical axis (Figure 1, wherein some of the optical elements are below (or above) the optical axis, similar to applicant's Figure 1 embodiment, but all are apparently along a common straight optical axis to the extent this term is understood). Williamson further discloses the first optical system including a first mirror for collecting and reflecting abaxial light (Figure 1, "M1"); one of the first or second imaging optical systems including a second mirror for reflecting light from the first mirror to the image plane side (Figures 1, "M2"); with the second mirror the abaxial light is caused to pass an outside of an effective diameter of the first mirror (Figure 1 re outside of the effective diameter of "M1"); the first imaging optical system including at least one positive lens (Figure 3 embodiment, "R1"); the second imaging optical system including at last one positive lens (Figure 3 embodiment, "R3"); a second lens group between the first and second mirrors (Figure 3 embodiment "R2"); the system can be telecentric with respect to both the object and image plane (Figure 2 embodiment, column 4, lines 21 and 51); the projection optical system has a magnification of reduction ratio (abstract); and the system for projecting a pattern of a mask onto a substrate (column 1, line 12). The system of Williamson would inherently include one of an ArF excimer laser or an F₂ laser, this being reasonably based upon Williamson disclosing the use of an excimer laser (column 6, line 64), the

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system being used for an exposure apparatus similar to the claimed invention, as well as upon the similarity in structure between Williamson and that of the claimed invention.

Prior Art Citations

Braat, Hudyma et al and Shafer et al are being cited herein to show projection optical systems that would read on claims rejected above, however, such rejections would have been repetitive. With reference to Hudyma and Shafer et al, these references disclose some of the optical elements as below (and/or above) the optical axis similar to applicant's figure 1 embodiment but are apparently "along a common straight optical axis" as this term is understood.

Allowable Subject Matter

The following is a statement of reasons for the indication of allowable subject matter: with respect to the allowable subject matter, none of the prior art either alone or in combination disclose or teach of the claimed combination of limitations to warrant a rejection under 35 USC 102 or 103. Specifically, with respect to claim 8, none of the prior art either alone or in combination disclose or teach of the claimed projection optical system comprising the claimed first and second image forming optical systems, both disposed along a common straight optical axis (to the extent this is understood), the first imaging system including a first mirror for reflecting and collecting abaxial light, one of the first and second imaging systems including a second mirror for reflecting light from the first mirror towards the image plane side, with the second mirror the abaxial light is caused to pass outside of an effective diameter of the first mirror, a lens group disposed between the first and second mirrors, and specifically further wherein the lens group has negative power and is disposed between the first mirror and a positive

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refractive lens of the first imaging optical system. Specifically, with respect to claims 9-30, none of the prior art either alone or in combination disclose or teach of the claimed projection optical system comprising the claimed first and second image forming optical systems, both disposed along a common straight optical axis (to the extent this is understood), the first imaging system including a first mirror for reflecting and collecting abaxial light, one of the first and second imaging systems including a second mirror for reflecting light from the first mirror towards the image plane side, with the second mirror the abaxial light is caused to pass outside of an effective diameter of the first mirror, and specifically further wherein the first mirror is part of a first mirror group of positive power and the system further includes a field optical system disposed between the first and second imaging optical systems for projecting a pupil of the first imaging optical system onto the second imaging optical system.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jordan M. Schwartz whose telephone number is (703) 308-1286. The examiner can normally be reached on Monday to Friday (8:00-5:30), alternate Fridays off.

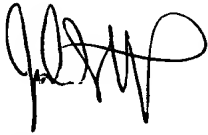
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Y. Epps can be reached at (703) 308-4883. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

A handwritten signature in black ink, appearing to read 'JMS', with a large loop at the end.

Jordan M. Schwartz
Primary Examiner
Art Unit 2873
April 18, 2002